

SOLAR ENERGY PULSE CHARGE DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a charge device, and more particularly to a solar energy pulse charge device.

2. Description of Related Art

In the subtropical zone, the sunlight is sufficient all the year. However, the weather becomes more and more hot due to a greenhouse effect so that the necessary amount of electric power is raised due to the temperature of the surrounding environment. Consequently, the amount of electric power is always limited in the summer. To use the solar energy is one of the solve methods of the limited amount of electric power. For example, to use the solar energy for street lamps can effectively achieve the purposes of economizing energy resources and environmental protection.

A town, for example, needs to pay a lot of money for the install cost, repair cost and electric bill for street lamps. Only the electric bill is a heavy burden of the local finance. However, a solar street lamp has a long use life and almost does not need to pay for electric bill. Consequently, the solar street lamp is considered to replace the conventional quicksilver street lamp.

However, the conventional solar energy charge device still charge the battery by floating charge way till full when the battery near a saturated condition. Consequently, the battery has no for a rest, is overcharged and cause a high temperature. As a result, the use life of the battery is shortened and the saving range of electric power is reduced.

1 The present invention has arisen to mitigate and/or obviate the
2 disadvantages of the conventional solar energy charge device.

3 SUMMARY OF THE INVENTION

4 The main objective of the present invention is to provide an improved
5 solar energy pulse charge device that is provided to replace the conventional
6 floating charge device for extending the use life of the battery.

7 To achieve the objective, the solar energy pulse charge device in
8 accordance with the present invention comprises a solar-powered panel and a
9 charging unit connected to the solar-powered panel for saving the energy
10 from the solar-powered panel. A control unit is electrically connected to the
11 charging unit for controlling the charging unit to charge or discharge. A
12 flyback circuit is electrically connected to the charging unit for providing
13 multiple independent power sources each having a unique reference potential.
14 A feedback voltage regulator circuit is electrically connected to the flyback
15 circuit for control the flyback circuit in a constant voltage and a cyclic start
16 circuit.

17 Further benefits and advantages of the present invention will become
18 apparent after a careful reading of the detailed description with appropriate
19 reference to the accompanying drawings.

20 BRIEF DESCRIPTION OF THE DRAWINGS

21 Fig. 1 is a block diagram of a solar energy pulse charge device in
22 accordance with the present invention;

23 Fig. 2 is a circuit diagram of a solar energy pulse charge device in
24 accordance with the present invention;

1 Fig. 3 is a flow chart of a solar energy pulse charge device in
2 accordance with the present invention; and

3 Fig. 4 is a battery charge curve and a constant current pulse wave
4 charge curve of a solar energy pulse charge device in accordance with the
5 present invention.

6 DETAILED DESCRIPTION OF THE INVENTION

7 Referring to the drawings and initially to Figs. 1-4, a solar energy
8 charge device in accordance with the present invention comprises a
9 solar-powered panel (10), a charging unit (20) connected to the
10 solar-powered panel (10), a control unit (30) electrically connected to the
11 charging unit (20), a flyback circuit (40) electrically connected to the
12 charging unit (20), a feedback voltage regulator circuit (50) electrically
13 connected to the flyback circuit (40) and a cyclic start circuit (60).

14 The solar-powered panel (10) is used as a power source of the present
15 invention.

16 The charging unit (20) includes a battery (21) parallel connected to a
17 light dependent resistor (22) and a charging switch (23). In the preferred
18 embodiment of the present invention, the charging switch (23) is a
19 metal-oxide-semiconductor field-effect transistor (MOSFET). A variable
20 resistor (24) is series connected to the light dependent resistor (22). The
21 charging unit (20) includes a first transistor switch (25) electrically
22 connected to the control unit (30). The charging unit (20) can collect the
23 power form the solar-powered panel (10) in a maximum efficiency and save
24 the power in the battery (21). The control unit (30) drives the charging unit

1 (20) to charge due to the first transistor switch (25) and the charging switch
2 (23).

3 The control unit (30) includes a system-on-chip (SOC) (31) and a
4 first integrated circuit (IC) (32). The SOC (31) has multiple pins respectively
5 electrically connected to that of the first IC (32). The first IC (32) can
6 transform the voltage signals from the light dependent resistor (22) of the
7 charging unit into frequency signals that are transmitted to the SOC (31) for
8 the SOC (31) to execute formula procedures.

9 The flyback circuit (40) includes a second transistor switch (41) and a
10 closed switching regulator (42), wherein the SOC (31) of the control unit (30)
11 controls the second transistor switch (41) and the second transistor switch
12 (41) controls the closed switching regulator (42). In the preferred
13 embodiment of the present invention, the closed switching regulator (42) is a
14 MOSFET. The second transistor switch (41) closes the closed switching
15 regulator (42) when receiving the signals from the SOC (31). The second
16 transistor switch (41) and the closed switching regulator (42) execute a
17 discharge control to the charging unit (20). The flyback circuit (40) is further
18 electrically connected to a load (70). In the preferred embodiment of the
19 present invention, the load (70) is a light emitting diode (LED). The flyback
20 circuit (40) provides multiple independent power sources each having a
21 unique reference potential.

22 The feedback voltage regulator circuit (50) includes a second IC (51)
23 for measuring the voltage of the load (70) and controlling the flyback circuit
24 (40) to make the load (70) in a constant voltage.

1 The cyclic start circuit (60) transmits back the frequency signals from
2 the first IC (32) to the SOC (31) that controls the cyclic start circuit (60) for
3 starting controlling the feedback voltage regulator circuit (50) and the
4 flyback circuit (40).

5 With reference to Fig. 3, the formula of the control unit (30) is
6 defined as a memory and a register. A counter is started and interrupts a
7 buffer overflow when the counter counts down within zero to determine that
8 a formula interruption belongs to an A/D optocoupler (80) or not. If the
9 formula interruption belongs to the A/D optocoupler (80), the system
10 determines whether the moment is from day to night, otherwise the system
11 determines whether the moment is from night to day.

12 When the moment being from daytime to night, firstly, the light
13 dependent resistor (22) of the charging unit (20) will measure the luminosity
14 of the surrounding environment. The first IC (32) of the control unit (30) will
15 transform the voltage signals from the light dependent resistor (22) into
16 frequency signals and transmit the frequency signals to the SOC (31) when
17 the luminosity of the surrounding environment reaches the standard dark
18 range of starting system. The action procedures of the formula control circuit
19 of the SOC (31) will drive and start the cyclic start circuit (60) to make a
20 capacitor in the cyclic start circuit (60) start saving energy for driving and
21 starting the second IC (51) to cause a waveform of 13KHz to the flyback
22 circuit (40) and maintain a pulse width modulation (PWM) for three seconds
23 for opening the closed switching regulator (42) to control the feedback
24 voltage regulator circuit (50) and the flyback circuit (40). At the same time,

1 the load (70) is started and the charging unit (20) is shut off. The feedback
2 voltage regulator circuit (50) feedback stabilizes voltage of the flyback
3 circuit to promote the saving ability of the coil in the flyback circuit (40) and
4 provide a stable voltage source to the load (70) when the voltage from the
5 battery (21) for the load (70) via the flyback circuit (40) is abated and
6 measured by the second IC (51) of the feedback voltage regulator circuit (50).
7 When the voltage of the battery (21) being under 11 volt, the SOC (31)
8 transmits a high-volt signal-ON to the second transistor switch (42) of the
9 flyback circuit (40) to close the closed switching regulator (42) and the
10 power source of the load (70) for only providing electric power to the SOC
11 (31) of the control unit (30) to prevent the control unit from a disconnection
12 and assure the present invention in a regular operation.

13 When the moment being from night to daytime, the SOC (31) of the
14 control unit (30) transmits a high-volt signal-NO to the second IC (41) of the
15 flyback circuit (40) to make the circuit of the present invention be directly
16 shortened after five seconds. As a result, the closed switching regulator (42)
17 is closed and stops to provide electric power to the load (70), and the
18 charging unit (20) is started and the battery (21) stops to provide electric
19 power to the load (70).

20 The system will determine the voltage of the battery (21) of the
21 charging unit (20) when the interruption is caused due to a voltage of the A/D
22 battery (90) not to a formula from the A/D optocoupler (80).

23 The SOC (31) of the control unit (30) transmits a high-volt
24 signal-LOW to the second transistor switch (41) of the flyback circuit (40)

1 when the voltage of the battery (21) is under 11 volt. As a result, the closed
2 switching regulator (42) is closed and stops to provide electric power to the
3 load to prevent the present invention from overly discharging.

4 The SOC (31) of the control unit (30) transmits a high-volt
5 signal-HIGH to the charging switch (23) of the charging unit (20) when the
6 voltage of the battery (21) is over 14 volt. As a result, the charging switch (23)
7 is conducted to make the main circuit of the solar-powered panel (10) be
8 shortened and the charging unit stops to charge the battery (21) to prevent the
9 battery (21) from being overly charged.

10 When the voltage of the battery (21) of the charging unit (10) being
11 between 21.7 volt and 14 volt, the SOC (31) drives the battery (21) to
12 intermittently receive the high and low potential via the first transistor switch
13 (25) for controlling the charging switch (23) conducted in intermittence to
14 automatically execute pulse charge. The charge method is executed to
15 prevent the battery (21) from being over charged and extend use life of the
16 battery (21).

17 With reference to Figs 1 and 4, the present invention can provide a
18 stable power source to an electric equipment, such as a street lamp, without
19 any extra power source and the SOC (31) of the control unit (30) can
20 determine the surrounding environment to execute charge or discharge. The
21 SOC (31) is used to control all of the actions of the present invention so that
22 the complication of the electric hardware is reduced for decreasing the
23 manufacturing cost. Furthermore, the SOC (31) can effectively charge the
24 battery (21) of the charging unit (20) and provide protections to the battery

1 (21). For example, the present invention can continuously provide electric
2 power to a street lamp for about seven days without any charging action.

3 In addition, the battery (21) of the charging unit (20) is charged in two
4 phases.

5 In the first phase: the battery (21) of the present invention is charged
6 in a constant electric current. The charging unit (20) can fully receive the all
7 the energy from the solar-powered panel (10) so that the charging time of the
8 present invention is shorter than that of conventional floating charge.

9 In the second phase: the battery (21) of the present invention is
10 charged in pulse charge to prevent the battery (21) from being over heat and
11 the battery (21) is in a relax condition during being charged to effective
12 extend the use life of the battery (21).

13 The light dependent resistor (22) of the present invention is series
14 connected to a variable resistor (24). Consequently, to adjust the resistant
15 value of the variable resistor (24) is to adjust the sensibility of the light
16 dependent resistor (22) of the charging unit (20) for suiting the surrounding
17 environment.

18 Although the invention has been explained in relation to its preferred
19 embodiment, it is to be understood that many other possible modifications
20 and variations can be made without departing from the spirit and scope of the
21 invention as hereinafter claimed.

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